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OIPE SEP 29 2006 IAP88 PATENT & TRADEMARK OFFICE

September 26, 2006

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Certificate
OCT 03 2006
of Correction

Re: U.S. Patent No. 7,092,562
Issued: August 15, 2006
Inventor: Marc Viala et al.
Our Docket No.: 34191

Sir:

A Certificate of Correction under 35 U.S.C. 254 is hereby requested to correct Patent Office printing errors in the above-identified patent. Enclosed herewith is a proposed Certificate of Correction (Form No. PTO-1050) and documentation in support of the proposed corrections for consideration.

It is requested that the Certificate of Correction be completed and mailed at an early date to the undersigned attorney of record. The proposed corrections are obvious ones and do not in any way change the sense of the application.

We understand that a check is not required since the errors were on the part of the Patent and Trademark Office in printing the patent.

Very truly yours,

Jeffrey J. Sopko

Jeffrey J. Sopko, Reg. No. 27676

JJS:ljw

Enclosures

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date indicated below.

Jeffrey J. Sopko
Name of Attorney for Applicant(s)

9/26/06 Jeffrey J. Sopko
Date **Signature of Attorney**

OCT - 3 2006

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,092,562 B2 PAGE 1 OF 1
DATED : August 15, 2006
INVENTOR(S) : Viala et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In Column 9, Line 20, please delete the ")" at the end of the equation after "Q"

In Column 11, Line 25, please delete the following equation:

"$z_k = (u_1^1, v_1^1, \theta_1^1, u_2^1, v_2^1, \theta_2^1, u_1^r, v_1^r, \theta_2^r\ x,y,z, \beta\phi r)^t$."

And insert this equation in its place:

- -$z_k = (u_1^1, v_1^1, \theta_1^1, u_2^1, v_2^1, \theta_2^1, u_1^r, v_1^r, \theta_1^r, u_2^r, v_2^r, \theta_2^r\ x,y,z, \beta\phi r)^t$.- -

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PATENT NO. 7,092,562 B2

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in other words the values χ_k, β_k, α_k, t_{xk}, t_{yk}, t_{zk} that give the best agreement between the representation of the environment and its image on the cameras (h close to 0) for all dots j in the model. The following equations are then solved recurrently:

(37) $h_p(x_k, z_k) = 0$, $h_d(x_k, z_k) = 0$, $h_{cy}(x_k, z_k) = 0$, or $h_c(x_k, z_k) = 0$

(one for each object already built, depending on the category of the object), in which observation vectors z_k are given by the appropriate formula

$$(38)\quad z_k = (u^l, v^l, u^r, v^r, x, y, z,)^t,$$

$$z_k = (u^l, v^l, \theta^l, u^r, v^r, \theta^r, x, y, z, \beta, \varphi)^t,$$

$$z_k = (u_1^l, v_1^l, \theta_1^l, u_2^l, v_2^l, \theta_2^l, u_1^r, v_1^r, \theta_1^r, u_2^r, v_2^r, \theta_2^r, x, y, z, \beta, \varphi, r)^t.$$

$$\text{or } z_k = (u^l, v^l, l_1^l, l_2^l, \theta^l, u^r, v^r, l_1^r, l_2^r, \theta^r, x, y, z, \beta, \varphi, r)^t$$

this is another application of the Kalman filter in which the estimated state vector in this case is (χ_k, β_k, α_k, t_{xk}, t_{yk}, t_{zk}). Module 22 performs this positioning.

The identification module 23 of the system automatically identifies at least some of the contours defined in the previous calculations, each time that an image is taken. It is proposed to proceed as follows:

- select a previous image k_0, preferably close to the current image k concerning positions and orientations of the photo;
- select points of interest I_0 on this previous image k_0, which can be done automatically, the points of interest having the general property that the brightness gradient close to them is high, and is not usually sensitive to changes in

orientations of the two observed limbs and the following measurement equation is obtained:

$$(19)\quad k_{cy}^{i}(x_k, z_k^i) = \begin{pmatrix} m_{I1} - m_{P1})xv_{I1} \\ v_{I1}.(m_1 x v_1) \\ m_{I2} - m_{P2})xv_{I2} \\ v_{I2}.(m_2 x v_2 \end{pmatrix} = 0$$

Figure 8 shows these parameters. v_{I1} and m_{I1}, v_{I2} and m_{I2} are deduced from z_k, as in the case of the straight line.

The circle is defined by a state vector conform with the following formula:

$$(20)\quad x_k = (x, y, z, \beta, \varphi, r)^t,$$

where x, y and z denote the coordinates of its center, β and φ the spherical coordinates of the unit vector along its normal and r is its radius. Furthermore, the formulas

$$(21)\quad m_k = R_k^i m + t_k^i \text{ and } v_k = R_k^i v$$

are applicable. If observation coordinates are represented by the function

$$(22)\quad z_k^i = (u, v, l_1, l_2, \theta),$$

the following equations

$$(23)\quad h_c^i(x_k, z_k^i) = \begin{pmatrix} q_0 - ((b^2(x_k^2 + y_k^2 + z_k^2 - r^2) + 1 - 2by_k)/Q) \\ q_1 - ((2ab(x_k^2 + y_k^2 + z_k^2 - r^2 2bx_k - 2ay_k)/Q)) \\ q_2 - ((2ac(x_k^2 + y_k^2 + z_k^2 - r^2) - 2cx_k - 2az_k)/Q \\ q_3 - ((2bc(x_k^2 + y_k^2 + z_k^2 - r^2) - 2cy_k - 2bz_k)/Q \\ q_4 - ((c^2(x_k^2 + y_k^2 + z_k^2 - r^2) + 1 - 2cz_k)/Q) \end{pmatrix} = 0$$

where $Q = a^2(x_k^2 + y_k^2 + z_k^2 - r^2) + 1 - 2bx_k$ express the transfer between the state vector and observations, in which $q_0, \ldots, q_4$ are derived from conversion of parameters (22)